



# MTBE

## Fact Sheet #1

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## Overview

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### What Is MTBE?

Methyl tertiary-butyl ether (MTBE) is a fuel additive made by combining methanol and isobutylene. The methanol is typically derived from natural gas; isobutylene can be derived as a byproduct of the petroleum refinery process. Since 1979, MTBE has been used in the United States as an octane-enhancing replacement for lead, primarily in mid- and high-grade gasoline at concentrations as high as 8 percent (by volume). Since the middle of the 1980s, it has been widely used throughout the country for this purpose. It is also used as a fuel oxygenate at higher concentrations (11 to 15 percent by volume) as part of the U.S. EPA's programs to reduce ozone and carbon monoxide levels in the most polluted areas of the country.

### MTBE And EPA's Clean Air Program

The Oxygenated Fuel (Oxyfuel) and Reformulated Gasoline (RFG) Programs were initiated by the U.S. EPA in 1992 and 1995, respectively, to meet requirements of the 1990 Clean Air Act Amendments (CAAA).

### The Oxyfuel Program

The Oxyfuel Program requires 2.7-percent oxygen (by weight) in gasoline during fall and winter months to reduce carbon monoxide emissions. In order to meet this requirement, gasoline producers must use oxygen containing compounds termed "fuel oxygenates" (e.g., ethanol, MTBE). When MTBE is used to meet the Oxyfuel requirements, it is added at a concentration of approximately 15 percent (by volume) to gasoline.

Although the total number of areas participating in the Oxyfuel Program may change from year to year, as of November 1997, the CAAA required 28 areas to participate. Some of these areas also use RFG in the non-winter months. The Minneapolis-St. Paul area is the only area to use Oxyfuel year round. The areas of the country that use Oxyfuel are presented in Exhibit 1.

### The RFG Program

The RFG Program requires 2-percent oxygen (by weight) year round in the most polluted metropolitan areas to reduce ozone and smog. When MTBE is used to meet the RFG requirements, its concentration in gasoline is 11 percent (by volume).

Ten metropolitan areas are required by the CAAA to use RFG (Baltimore, Chicago, Hartford, Houston, Los Angeles, Milwaukee, New York, Philadelphia, Sacramento, San Diego). Another 22 areas in 13 states and the District of Columbia voluntarily participate in the RFG Program (Arizona, Connecticut, Delaware, Kentucky, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Texas, and Virginia). California has a separate statewide program with more stringent standards than the federal RFG program. As with the Oxyfuel Program, the total number of areas participating in the RFG Program may change from year to year. The areas of the country that use RFG are shown in Exhibit 2.

Although more data need to be collected to determine the specific benefits that these programs have had on air quality, the initial research has shown significant reductions in carbon monoxide, ozone, benzene, and other toxic air pollutants as a result of the use of oxygenated fuels.

### Why Is There Concern About MTBE?

CERCLA ("Superfund") lists MTBE as a hazardous substance. Although it is known to be less toxic than many other gasoline constituents, people have raised concerns about the potential for acute effects from inhaling it at service stations and longer term effects from drinking water contaminated with it. MTBE is also considered a potential human carcinogen.

In comparison to petroleum products, MTBE poses additional problems when it escapes into the environment through gasoline releases; typically from under-

ground storage tank systems, above-ground storage facilities, or pipelines. MTBE is capable of traveling through soil rapidly, is much more soluble in water than most other petroleum constituents, and is more resistant to biodegradation. As a result, it often travels farther than other gasoline constituents, making it more likely to impact public and private drinking water wells. Because of its affinity for water and, consequently, its tendency to form large plumes, petroleum releases with MTBE can be more difficult and costly to remediate than petroleum releases that do not contain MTBE.

### U.S. EPA Health Advisory

In December 1997, the U.S. EPA Office of Water released *Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Methyl tertiary-Butyl Ether (MTBE)* EPA 822-F-97-008. The document is a summary and interpretation of the latest data on MTBE health effects and organoleptic properties. It does not impose any regulatory requirements on the providers of public drinking water; instead, it recommends contaminant level concentrations that would be acceptable to most consumers of public drinking water supplies.

The recommendations are based primarily on taste and odor thresholds. The *Advisory* states that drinking water containing "... concentrations in the range of 20 to 40  $\mu\text{g/L}$  [ppb] would likely avoid unpleasant taste and odor effects ..." for a large majority of people. The document also notes that there is a large variation in the concentrations people are able to detect. The various factors influencing detection limits include individual sensitivities,

water quality, and water temperature. As a result, some people may detect MTBE below 20 ppb while others may not notice it until levels exceed 100 ppb or more.

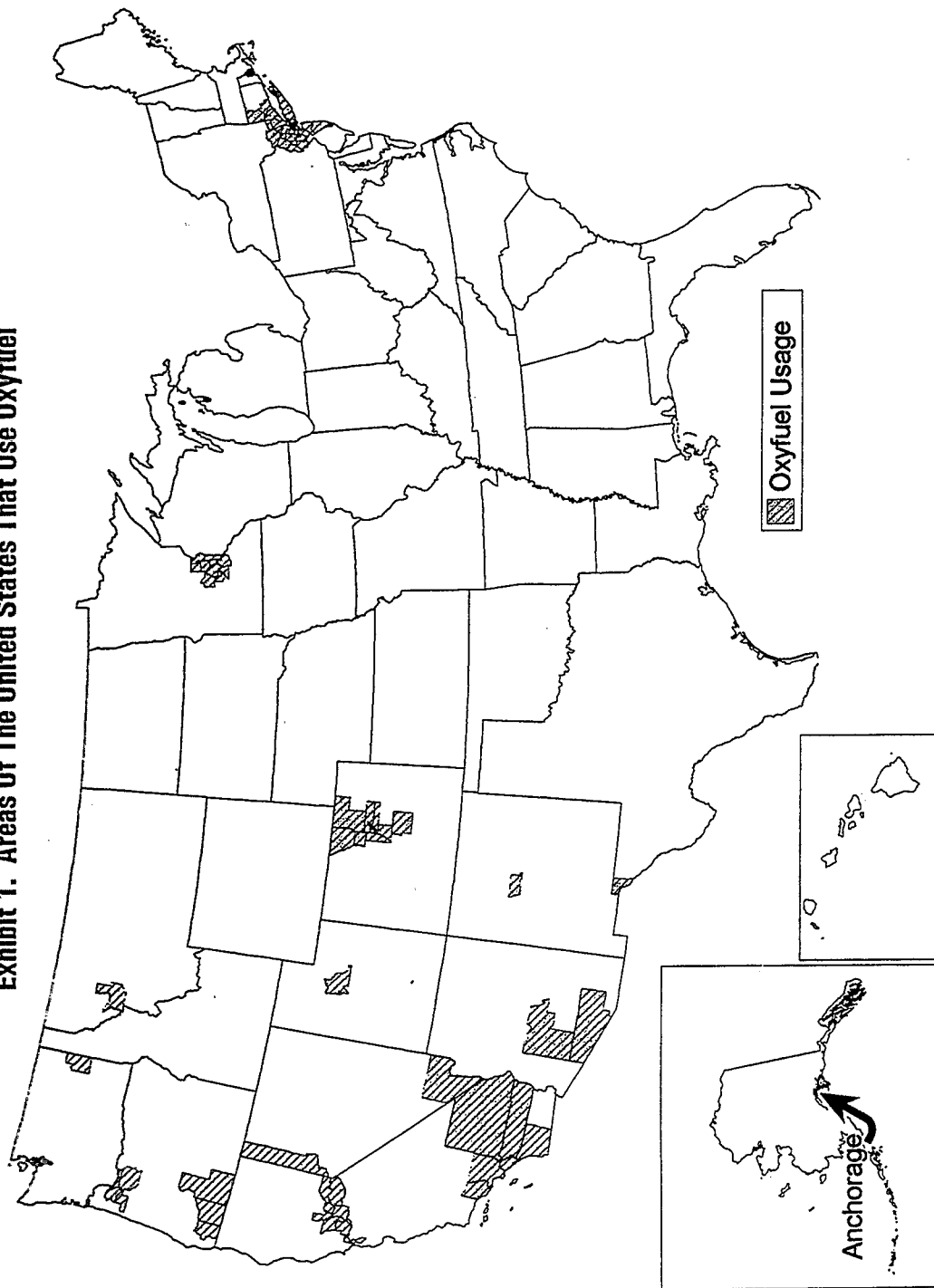
The document also concludes that there is little likelihood that MTBE concentrations between 20 and 40 ppb would cause adverse health effects because the concentration is 4 to 5 orders of magnitude lower than the lowest concentration that caused observable health effects in animals. Specifically, concentrations in this range are about 20,000 to 100,000 or more times lower than the range of exposure levels in which cancer or noncancer effects were observed in rodent tests. This margin of exposure is in the range of margins of exposure typically provided for cancer effects in drinking water standards and is greater than such standards typically provided for noncancer effects.

After a thorough evaluation of all available health effect studies, the U.S. EPA has determined that a lifetime exposure health effects-based recommendation for MTBE cannot be extrapolated from the data at this time. Once additional studies are completed that permit a justifiable extrapolation for human exposure, the current document will be replaced by a final health advisory.

### **State Standards**

Twenty-three states have established regulatory guidelines or standards for MTBE contamination in groundwater or drinking water. These states are: Arizona, Arkansas, California, Connecticut, Florida, Illinois, Indiana, Kansas, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Vermont, Wisconsin, and Wyoming. Cleanup levels range from 12 ppb in Wisconsin to 240 ppb in Michigan; three states (Arkansas, Indiana, and Maryland) have site-specific guidelines.

**Exhibit 1. Areas Of The United States That Use Oxyfuel**



**Exhibit 2. Areas Of The United States That Use Reformulated Gasoline**

